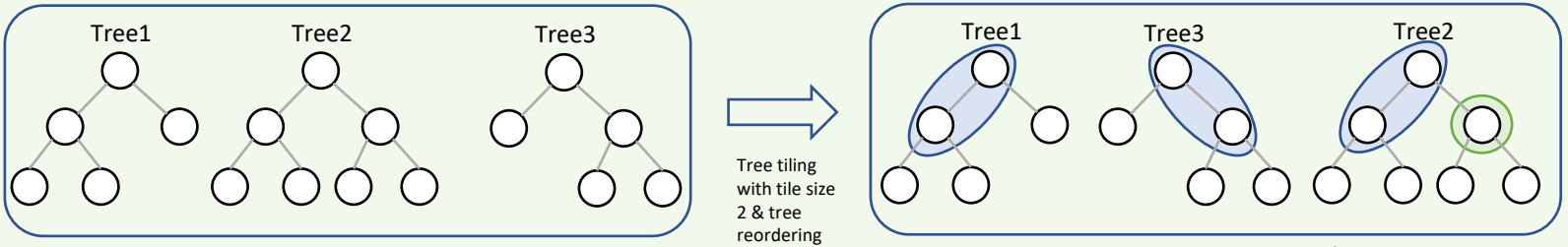
User code

```
inferenceRunner = treebeard.FromModelFile(modelFile, options)
results = inferenceRunner.RunInference(batch)
```

High level IR



Mid level IR

```
for t = 0 to 1 step 1 {
 for i = 0 to batchSize step 1 {
  tree = getTree(forest, t)
  node = getRoot(tree)
  node = traverseTile(node, rows[i])
  treePrediction =getLeafValue(node)
  prediction[i] = prediction[i] + treePrediction
 }
}
for t = 1 to 3 step 1 {
 for i = 0 to batchSize step 1 {
  tree = getTree(forest, t)
  node = getRoot(tree)
  node = traverseTile(node, rows[i])
  node = traverseTile(node, rows[i])
  treePrediction =getLeafValue(node)
  prediction[i] = prediction[i] + treePrediction
 }
}
```

Unroll tree walks

One tree at a time

```
for t = 0 to 1 step 1 {
 for i = 0 to batchSize step 1 {
  tree = getTree(forest, t)
  treePrediction = WalkDecisionTree(tree, rows[i])
  prediction[i] = prediction[i] + treePrediction
 }
}
for t = 1 to 3 step 1 {
 for i = 0 to batchSize step 1 {
  tree = getTree(forest, t)
  treePrediction = WalkDecisionTree(tree, rows[i])
  prediction[i] = prediction[i] + treePrediction
 }
}
```

One row at a time

```
for i = 0 to batchSize step 1 {
 prediction = 0
 for t = 0 to 1 step 1 {
  tree = getTree(forest, t)
  treePrediction = WalkDecisionTree(tree, rows[i])
  prediction = prediction + treePrediction
 }
 for t = 1 to 3 step 1 {
  tree = getTree(forest, t)
  treePrediction = WalkDecisionTree(tree, rows[i])
  prediction = prediction + treePrediction
 }
 predictions[i] = prediction
}
```

Low level IR

Vectorize

```
// ...
// Low level IR for single traverseTile
thresholds = loadThresholds(tree, n)
featureIndices = loadFeatureIndices(tree, n)
// Gather required feature from the current row
features = rows[i][featureIndices]
// Vector comparison of features and thresholds
comparison = features < thresholds

// Pack bits in comparison vector into an integer
comparisonIndex = combineBitsIntoInt(comparison)

// Get child index of tile we need to move to
tileShape = loadTileShape(tree, n)
childIndex = LUT[tileShapeID, comparisonIndex]

// Move to the correct child of the current node
n = getChildNode(tree, n, childIndex)
// ...
```

Lower to LLVM IR